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APPLICATION FOR UNITED STATES LETTERS PATENT

FOR A

CURL RESISTANT SINGLE SUBSTRATE LABEL SHEET AND A METHOD FOR MAKING SAME

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TECHNICAL FIELD

The present invention relates to the field of laminated label sheets, and more specifically, to single substrate curl resistant label sheets for use with conventional laser printers, and a method for making the same.

BACKGROUND OF THE INVENTION

Label sheets are commonly available in a number of configurations for use with any number of printers. The most common type of label sheets are laminates generally consisting of a paper overlay, or multiple overlays, and an underlying release liner, joined together with an adhesive.

The underlying release liner is most commonly a lightweight paper coated on at least one side with liquid silicon that is thermally cured to provide a low adhesion surface to which the overlay is releasably bonded with the adhesive. Such liners are generally pre-manufactured by others and therefore have to be separately introduced into the label sheet manufacturing process. Additionally, since such liners are generally purchased from a separate vendor they usually contain unimaginative printing, if any, and are prohibitively expensive when ordered with custom markings. The adhesive provides a bond between the overlay and the silicone liner that is generally sufficiently strong to hold the overlay and the liner together until separation is desired. Often label sheets include several individual labels cut in the overlay.

Such traditional label sheets have been plagued by many problems when used in modern printers. Most commonly, tight turning radiuses in the sheet feed path of modern printers cause premature separation of the labels from the liner in the printer resulting in expensive repair work.

Additionally, exposure of the label to the heat of a fuser in a modern laser printer often results in liquefaction of the adhesive. Such liquefied adhesive may then be expelled from between the overlay and the release liner during printing causing significant damage to expensive printing equipment. Further, silicon coated release liners are virtually impossible to print on, even when they are only coated with silicon on one side. Additionally, release liners that are silicon coated on only one side tend to curl when exposed to heat often rendering the label useless. This is particularly true when the release liner does not completely cover the overlay, as is often desired. Further, embodiments having partial release liners are further plagued by increased curling problems on the portion of the label sheet that does not contain the release liner, a problem heightened when duplex laser printers are used. Lastly, silicon coated release liners are also relatively expensive and often are difficult to introduce in the label sheet making process.

Label sheets have wide ranging application. In the pharmacy industry label sheets are utilized for pharmacy scripts whereby they have numerous uniquely sized labels for application to drug containers contained in the sheet along with several detachable sections that may serve as a customer receipt, a pharmacy order copy, as well as sections directed toward informing the customer of application instructions and potential dangers, among others. As such, a pharmacy script may easily consist of well over a dozen individual areas that require application of unique printing.

Numerous attempts have been make to overcome some of these difficulties. For example, U.S. Patent No. 6,410,111 to Roth et al. has attempted to reduce the problem of premature separation of the overlay and the liner with the use of bond areas of varying strengths. The selective application of varying release coatings and adhesive bonds requires unique equipment and processes. U.S. Patent No. 6,254,952 to Fox et al. introduces a leading edge feed strip to

reduce the potential for premature separation caused by printer rollers. The introduction of the leading edge feed strip reduces the area available for labels and increases waste.

Traditionally, label sheet manufacturers have not produced label sheets that contain individual labels that extend all the way to the edge of the sheet due to the likelihood of premature separation, discussed above, and the issue of adhesive liquefaction. Maintaining the individual labels inward from the label sheet edges permits the manufacturer to avoid application of adhesive near the edges of the label sheet. Therefore, even if liquefaction occurs during printing, the liquefied adhesive is unlikely to be expelled from the label sheet and cause damage to the printer. This adhesive setback region results in reduced area available for labels, thereby increasing waste, and has been a limitation on the sheet label industry.

Further, manufacturers of label sheets have long recognized that the end users of the label sheets desire the ability to print indicia on both sides of a curl resistant label sheet that may have preprinted indicia on the release liner front surface and the overlay's rear surface, while using an off the shelf printer. While U.S. Patent No. 6,304,849 to Uecker et al., attempts to solve many of the problems previously discussed, it teaches the use of a preferred printer having fewer paper feed path turns of small radius than a conventional printer, and having lower fusing temperature.

The instant invention utilizes a curl resistant single substrate to create both the overlay and the release liner, thereby overcoming many of the problems of the prior art. Manufacturing a release liner of the same material as the overlay that receives a release coat, eliminates the need for expensive silicon coated release liners and their inherent problems. Additionally, the instant invention may incorporate features designed to increase the rigidity of the label sheet, thereby reducing curling and the likelihood of printer jams. Further, such construction permits the use of a web offset lithography printing process rather than traditional label printing methods, thereby

significantly improving production time, waste production, color capabilities, availability of auxiliary elements such as remoist and scratch-off areas, nesting variations, and quality.

Accordingly, the art has needed a means for improving the art of label sheets designed for use with conventional off the shelf printers, including duplex printers. While some of the prior art devices attempted to improve the state of the art, none has achieved the unique and novel configurations and capabilities of the present invention. With these capabilities taken into consideration, the instant invention addresses many of the shortcomings of the prior art and offers significant benefits heretofore unavailable. Further, none of the above inventions and patents, taken either singly or in combination, is seen to describe the instant invention as claimed.

SUMMARY OF INVENTION

In its most general configuration, the present invention advances the state of the art with a variety of new capabilities and overcomes many of the shortcomings of prior devices in new and novel ways. In its most general sense, the present invention overcomes the shortcomings and limitations of the prior art in any of a number of generally effective configurations. The instant invention demonstrates such capabilities and overcomes many of the shortcomings of prior methods in new and novel ways. In one of the many preferable configurations, the curl resistant single substrate label sheet for use with conventional printers has at least one body portion, at least one label portion, and at least one release liner portion, all of which are made of a common substrate. The term conventional laser printer used throughout refers to a non-custom printer having standard fuser temperatures and standard paper feed paths, including duplex printers.

Each of the three portions previously identified has a front and a rear surface that may be printed upon. The label portion is contiguous with the body portion and has at least one heat resistant adhesive applied to at least a portion of the rear surface. Additionally, the label portion is formed to have at least one label. The release liner has at least one heat resistant release coating on at least a portion of the front surface, and is releasably bonded to the label portion by the heat resistant adhesive.

The label sheet has a plurality of edges including, in one embodiment, at least a top edge, a bottom edge, a left edge, and a right edge. The heat resistant adhesive of the present invention does not liquefy when exposed to the heat of a conventional laser printer fuser, thereby permitting the at least one label to extend all the way to at least one of the plurality of edges. As such, the label portion may include multiple labels extending to the plurality of edges thereby maximizing the usable label area and minimizing waste. Further, the label sheet may have the label portion in any location on the label sheet.

The single substrate construction of all portions of the label sheet allows the label sheet to contain printed indicia on the front and rear surfaces of all portions of the label sheet. Additionally, the single substrate design permits use in conventional laser printers. Therefore, the end user may then print on any portion of the body portion front and rear surfaces, any portion of the label portion front surface, and any portion of the release liner rear surface. Further, the unique construction and manufacturing method of the present invention permits the label sheet to further contain printed indicia on at least a portion of the label portion rear surface and at least a portion of the release liner front surface.

The label sheet of the present invention may include a number of additional variations including such elements as remoist areas; removable foil, or scratch-off, areas; lines of perforation; fold lines; and viewing windows.

The single substrate construction of the instant invention is particularly significant for a number of reasons. It allows the sheet label to be produced in a high speed in-line manufacturing method, it provides the release liner with the rigidity necessary to be coated on a single side with a release coating and not curl when printed on, it permits a release liner to accept printed indicia on either the front or rear surface during the manufacturing process, and allows the end user to apply printed indicia to the rear surface using a conventional printer.

Additional curl prevention features, such as the inclusion of at least one score in the label sheet, may be incorporated into the present invention. The inclusion of at least one score increases the rigidity of the label sheet and further increases the curl resistance of the label sheet. The at least one score is preferably across the grain of the substrate and need only compress the grain slightly to realize great curl prevention benefits. Research has shown an embodiment including a first score and a second score that extend substantially orthogonally from the bottom edge of the label sheet may reduce curl as much as 85% over conventional label sheets. The at least one score should not be continuous over the entire length of the label sheet, as continuous score lines tend to promote curling across the grain of the substrate. Research indicates that in one embodiment the preferred length of the at least one score is approximately 25% of the overall length of the label sheet, or less. Another advantage of the carefully applied at least one score of the present invention is that they substantially disappear from sight upon exposure to the heat of the conventional printer.

The high speed in-line manufacturing method used to prepare the label sheets may accept the output of a continuous web press. The method generally consists of first providing a web of substrate to the process, followed by application of a strip of release coating that is then cured in a dryer, application of a strip of heat resistant adhesive, folding the substrate back upon itself thereby releasably joining it, and lastly trimming off any excess and cutting the individual label sheets. The process may alternatively include a slit-and-merge process in lieu of the previously described folding and trimming method. Either of the previously described in-line methods may further include the step of printing any number of colors on of the web of substrate prior to applying the release coating and the step of introducing at least one score line into the substrate across the grain of the substrate.

These variations, modifications, alternatives, and alterations of the various preferred embodiments, arrangements, and configurations may be used alone or in combination with one another as will become more readily apparent to those with skill in the art with reference to the following detailed description of the preferred embodiments and the accompanying figures and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Without limiting the scope of the present invention as claimed below and referring now to the drawings and figures:

FIG. 1 shows a curl resistant single substrate label sheet in top plan view, in reduced scale;

FIG. 2 shows the label sheet of FIG. 1 in right side elevation view, in reduced scale;

FIG. 3 shows the label sheet of FIG. 1 in rear plan view, in reduced scale;

FIG. 4 shows a variation of the label sheet of FIG. 1 in top plan view, in reduced scale;

FIG. 5 shows a variation of the label sheet of FIG. 1 in top plan view, in reduced scale;

FIG. 6 shows a schematic of the in-line production method of the label sheet of FIG. 1, in reduced scale; and

FIG. 7 shows a variation of the label sheet of FIG. 1 in top plan view, in reduced scale.

DETAILED DESCRIPTION OF THE INVENTION

The curl resistant single substrate label sheet for use with conventional printers of the instant invention, and the method of making the same, enables a significant advance in the state of the art. The preferred embodiments of the apparatus accomplish this by new and novel arrangements of elements and methods that are configured in unique and novel ways and which demonstrate previously unavailable but preferred and desirable capabilities.

The detailed description set forth below in connection with the drawings is intended merely as a description of the presently preferred embodiments of the invention, and is not intended to represent the only form in which the present invention may be constructed or utilized. The description sets forth the designs, functions, means, and methods of implementing the invention in connection with the illustrated embodiments. It is to be understood, however, that the same or equivalent functions and features may be accomplished by different embodiments that are also intended to be encompassed within the spirit and scope of the invention.

With reference generally now to FIG. 1 through FIG. 5, the curl resistant single substrate label sheet **50** for use with conventional printers has at least one body portion **100**, at least one

label portion **200**, and at least one release liner portion **300**, all of which are made of a common substrate **400**. With particular reference to FIG. 1 to FIG. 3, the at least one body portion **100** has a front surface **110** and a rear surface **120**, the at least one label portion **200** has a front surface **210** and a rear surface **220**, and the at least one release liner **300** has a front surface **310** and a rear surface **320**. The at least one label portion **200** is contiguous with the body portion **100** and has at least one heat resistant adhesive **230** applied to at least one portion of the rear surface **220**. Further, the at least one label portion **200** has at least one label **500** formed in the label portion **200**. The at least one release liner **300** has at least one heat resistant release coating **330** on at least one portion of the front surface **310**, and is releasably bonded to the label portion **200** by the at least one heat resistant adhesive **230**. The term conventional laser printer used throughout refers to a non-custom printer having standard fuser temperatures and standard paper feed paths, including duplex printers. The common substrate **400** may include virtually any printing media, and in one preferred embodiment consists of micro optical character recognition.

The label sheet **50** has a plurality of edges including, in one embodiment, at least a top edge **52**, a bottom edge **54**, a left edge **58**, and a right edge **56**. The heat resistant adhesive **230** of the present invention does not break down when exposed to the heat of a conventional laser printer fuser, thereby permitting the at least one label **500** to extend all the way to at least one of the plurality of edges. As such, the at least one label portion **200** may include multiple labels **500** extending to the plurality of edges thereby maximizing the usable label area and minimizing waste. A further variation of the present embodiment may include the situation wherein the at least one label portion **200** is bounded on three sides by the top edge **52**, the left edge **58**, and the right edge **56**, and substantially all of the label portion **200** is formed into the at least one label **500**.

As illustrated in FIG. 4, the label sheet **50** may have the at least one label portion **200** in any location on the label sheet **50**. As illustrated in FIG. 4, the at least one label portion **200** may separate two distinct body portions **100**. Similarly, the label sheet **50** may include numerous label portions **200**. The configurations are endless, however the configuration illustrated in FIG. 1, FIG. 2, and FIG. 3, has particular application in the pharmacy industry.

The unique application of a single substrate **400** to construct all portions of the label sheet **50** allows the label sheet **50** to contain printed indicia on at least a portion of the at least one body portion front **110** and rear surfaces **120**, at least a portion of the at least one label portion front surface **210**, and at least a portion of the at least one release liner rear surface **320**. Therefore, the present label sheet **50** permits hidden messages or directions to be printed on the at least one release liner front surface **310** or the at least one label portion rear surface **220**, that is only revealed when one of the at least one labels **500** is removed from the at least one label portion **200**. Further, the single substrate **400** design permits use in conventional laser printers. Therefore, the end user may then print on any portion of the at least one body portion front **110** and rear surfaces **120**, any portion of the at least one label portion front surface **210**, and any portion of the at least one release liner rear surface **320**. Additionally, the unique construction and manufacturing method of the present invention permits the label sheet **50** to further contain printed indicia on at least a portion of the at least one label portion rear surface **220**, and at least a portion of the at least one release liner front surface **320**.

The label sheet **50** of the present invention may include a number of additional variations including such elements as at least one remoist area **600**, at least one removable foil, or scratch-off, area **700**, at least one line of perforation **800**, at least one fold line **900**, and at least one viewing window **1000**, as illustrated in FIG. 5.

The label sheet **50** of the present invention may also include additional curl prevention features. For example, the label sheet **50** may include at least one score **950** to increase the rigidity of the label sheet **50**, as seen in FIG. 7. The at least one score **950** is preferably across the grain of the substrate and need only compress the grain slightly to realize great curl prevention benefits. Research has shown that the at least one score **950** extending from the bottom edge **54**, or the edge that first enters the printer, may reduce curl by as much as 85% over conventional label sheets. Additionally, one embodiment includes a first score **955** and a second score **960** extending substantially orthogonally from the bottom edge into the at least one body portion. The at least one score **950** should not be continuous over the entire length of the label sheet **50**, as continuous score lines tend to promote curling across the grain of the substrate. Research indicates that in one embodiment the preferred length of the at least one score **950** is approximately 25% of the overall length of the label sheet **50**, or less. Another advantage of the carefully applied at least one score **950** of the present invention is that they substantially disappear from sight upon exposure to the heat of the conventional printer.

The single substrate **400** construction of the instant invention is particularly significant for a number of reasons. It allows the sheet label **50** to be produced in a high speed in-line manufacturing method. Further, the use of a common substrate **400** for the at least one release liner **300** as is used for the at least one body portion **100** and the at least one label portion **200**, provides the rigidity necessary to the at least one release liner **300** so that it may be coated on a single side with a release coating **330** and not curl when printed on with a conventional printer. Additionally, unlike prior art backing sheets and release liners, the at least one release liner **300** of the present invention may accept printed indicia on either the front surface **310** or the rear

surface **320** during the manufacturing process and the end user may apply printed indicia to the rear surface **320** using a conventional printer.

The high speed in-line manufacturing method previously eluded to is illustrated in FIG. 6. The first step in the method consists of providing a web of substrate **450**, in a longitudinal direction, of indeterminate length having a front surface **455** and a rear surface **460** and two laterally opposite edges **465**, **470**. The web of substrate **450** may be supplied directly from a web printing process to this in-line manufacturing method. Next, a strip of release coating **330** is applied to at least a portion of the rear surface **460** of the substrate by the release coat applicator **1010** and is then cured in a dryer **1020**. A strip of heat resistant adhesive **230** is then applied to at least a portion of the rear surface **460** of the substrate by the adhesive applicator **1030**, as shown in FIG. 6, or to the strip of release coating **330**. The folder **1050** then folds the web of substrate **450** longitudinally along a fold line **900** thereby releasably joining a plurality of portions of the rear surface **460**, and the fold line **900** is trimmed from the web of substrate **450** via the diecutter **1060**. The diecutter **1060** may additionally trim all the edges of the web of substrate **450**. Lastly, the cutoff station **1070** cuts the web of substrate **450** into a succession of separate curl resistant single substrate label sheets **50**. Alternatively, the in-line manufacturing method may use a slit-and-merge process in lieu of the previously described folding and trimming method. For instance, the slitter **1040** may slice the web of substrate **450** longitudinally along a cut line thereby creating a plurality of sections of the web of substrate **450**. The plurality of sections of the web of substrate may then be merged longitudinally about the cut line via the folder **1050** thereby releasably joining a plurality of portions of the rear surface. Either of the previously described in-line methods may further include the step of printing at least one color on a portion of the front surface or the rear surface of the web of substrate, or both, prior to applying the strip

of release coating. In further embodiments, the high speed in-line manufacturing method shown in FIG. 6 may be a part of a production line for a magazine or similar printed publication, in which individual label sheets **50** are meant to be inserted as bound-in, adhered-in, or blown-in inserts. Additionally, the previously described in-line methods may further include the step of introducing at least one score line into the substrate across the grain of the substrate.

Numerous alterations, modifications, and variations of the preferred embodiments disclosed herein will be apparent to those skilled in the art and they are all anticipated and contemplated to be within the spirit and scope of the instant invention. For example, although specific embodiments have been described in detail, those with skill in the art will understand that the preceding embodiments and variations can be modified to incorporate various types of substitute and or additional or alternative materials, relative arrangement of elements, and dimensional configurations. Accordingly, even though only few variations of the present invention are described herein, it is to be understood that the practice of such additional modifications and variations and the equivalents thereof, are within the spirit and scope of the invention as defined in the following claims.

The corresponding structures, materials, acts, and equivalents of all means or step plus function elements in the claims below are intended to include any structure, material, or acts for performing the functions in combination with other claimed elements as specifically claimed.